



Conduction cooling study in KEK

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On behalf of Nb₃Sn group

2022/10/12 TTC2022 in Aomori

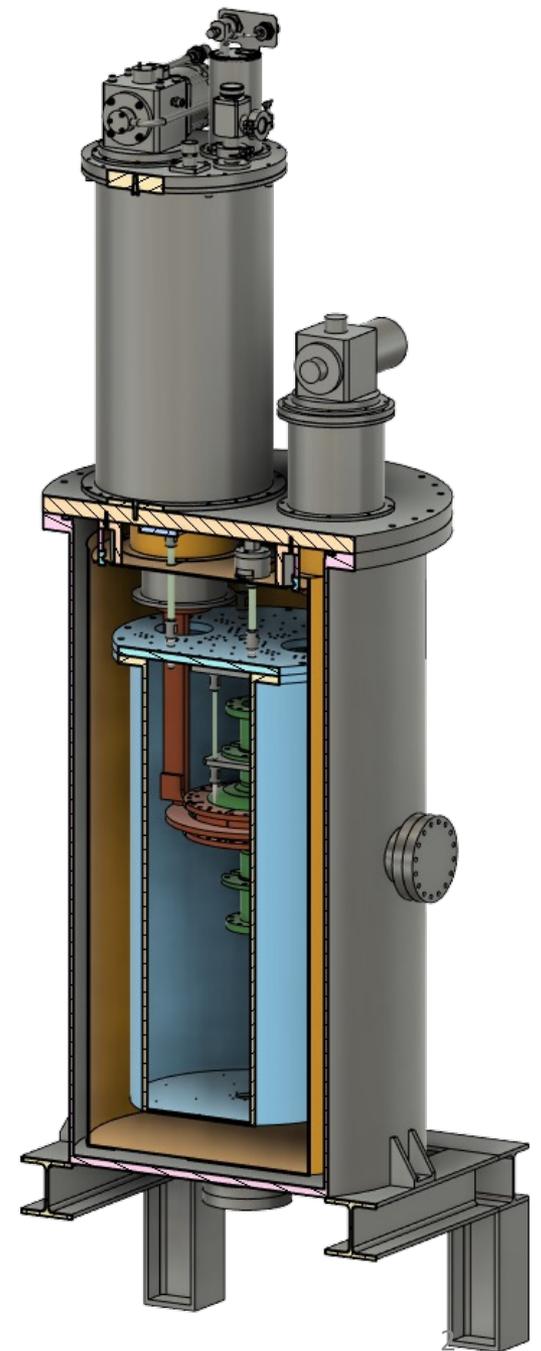
Goal of this fiscal year

(~Mar. 2023)

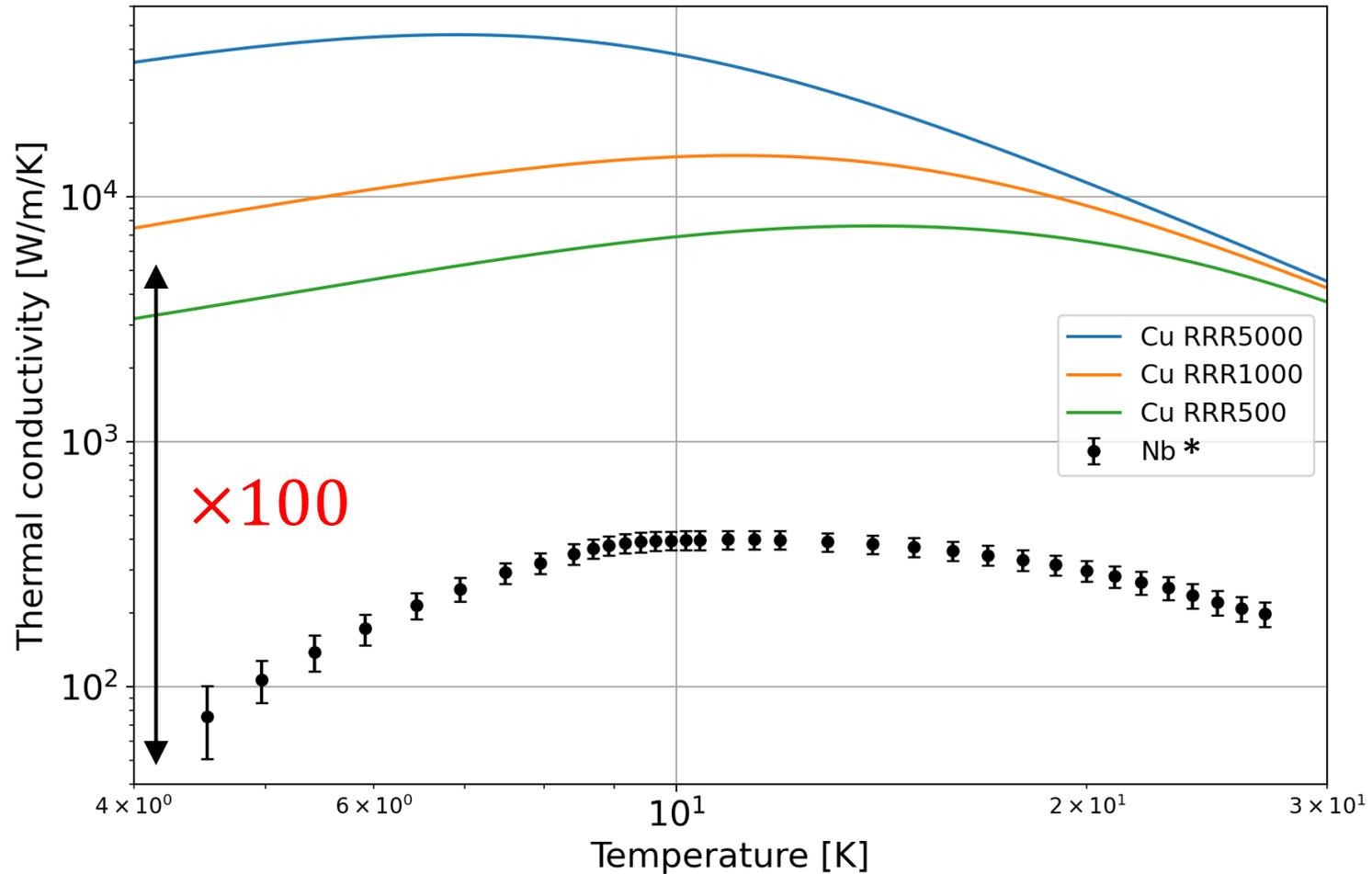
Vertical test of Nb₃Sn cavity
with
conduction cooling
by GM/JT cryocooler
(Collaboration with SHI)

Key technique:

How to effectively extract heat
from the cavity



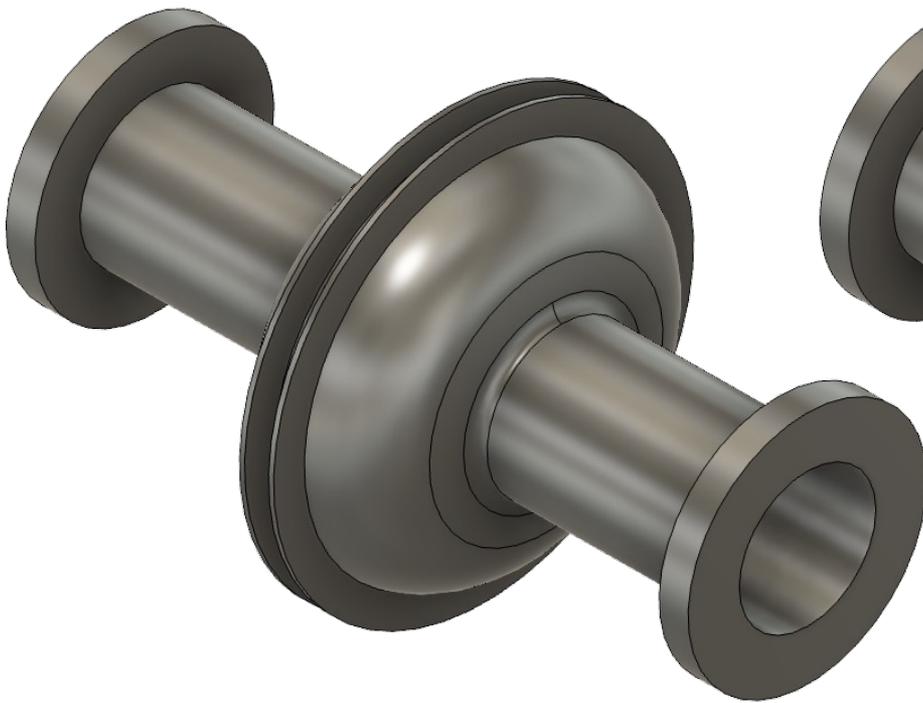
Thermal conductivity: Cu vs. Nb



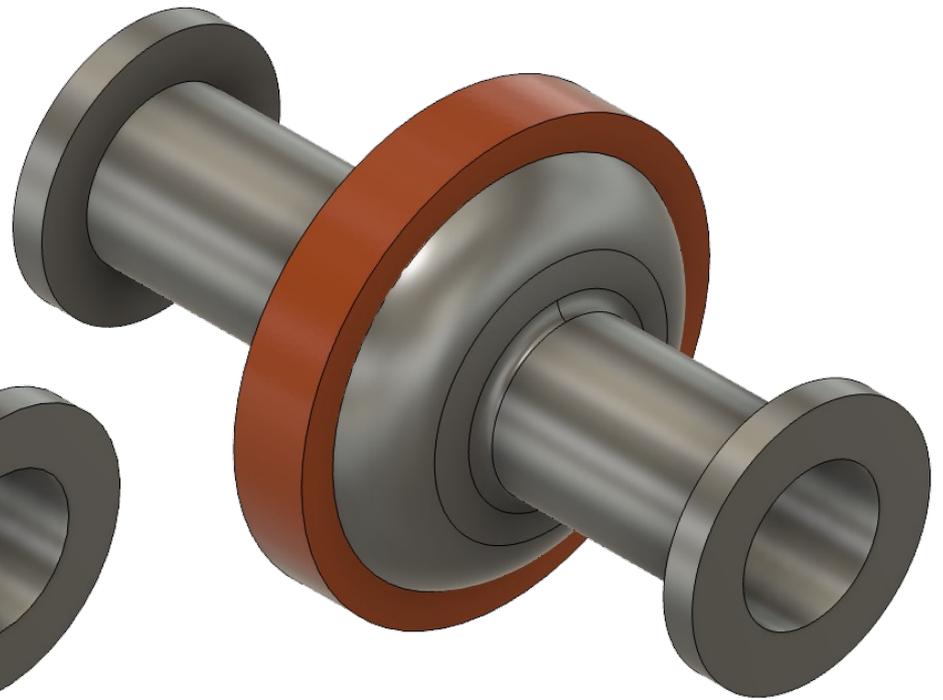
* Measured value in KEK, samples were annealed with Nb3Sn coating temperature parameter.

Thermal contact

We find two approaches in conductive cooling of SRF cavity.



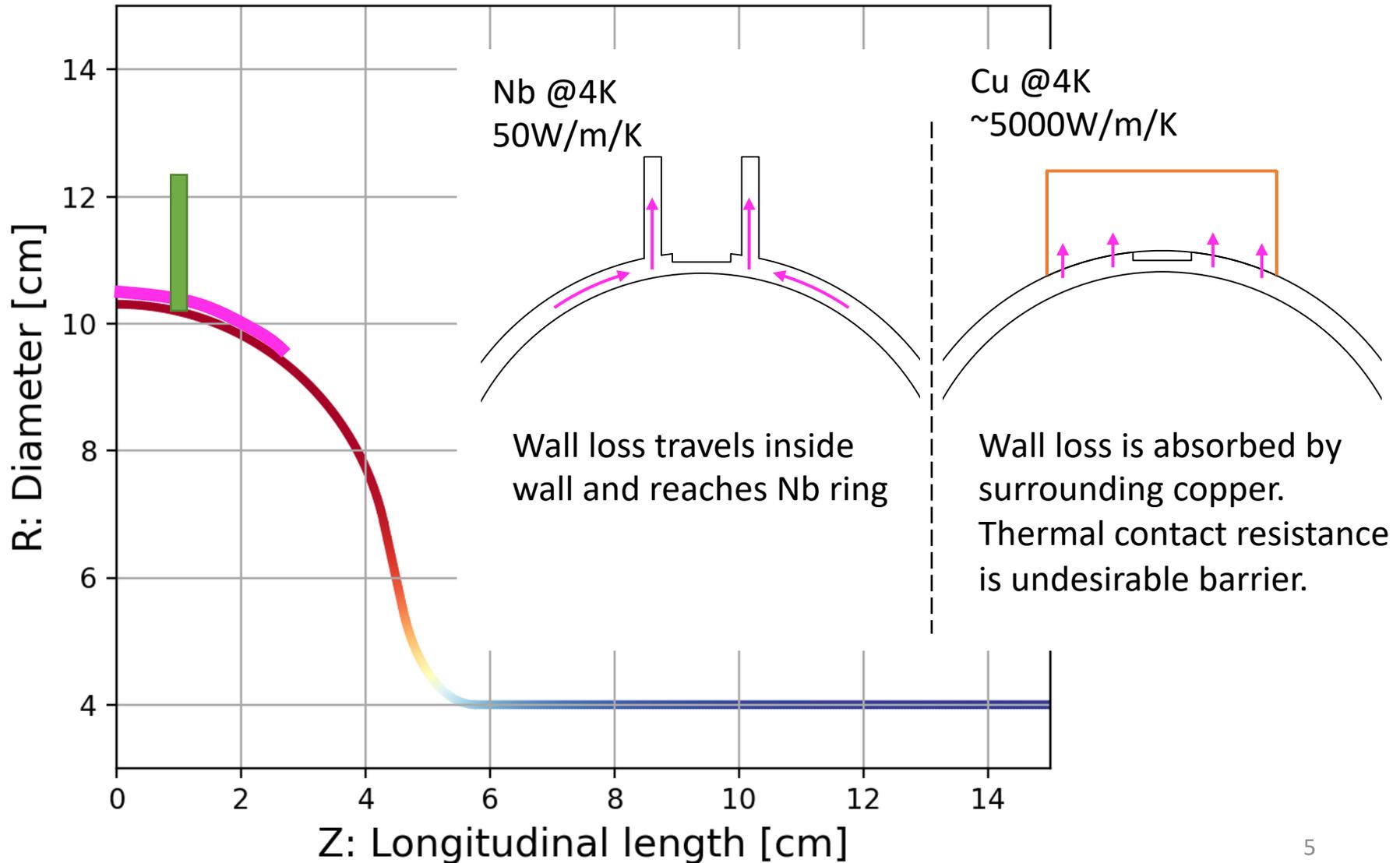
Nb ring



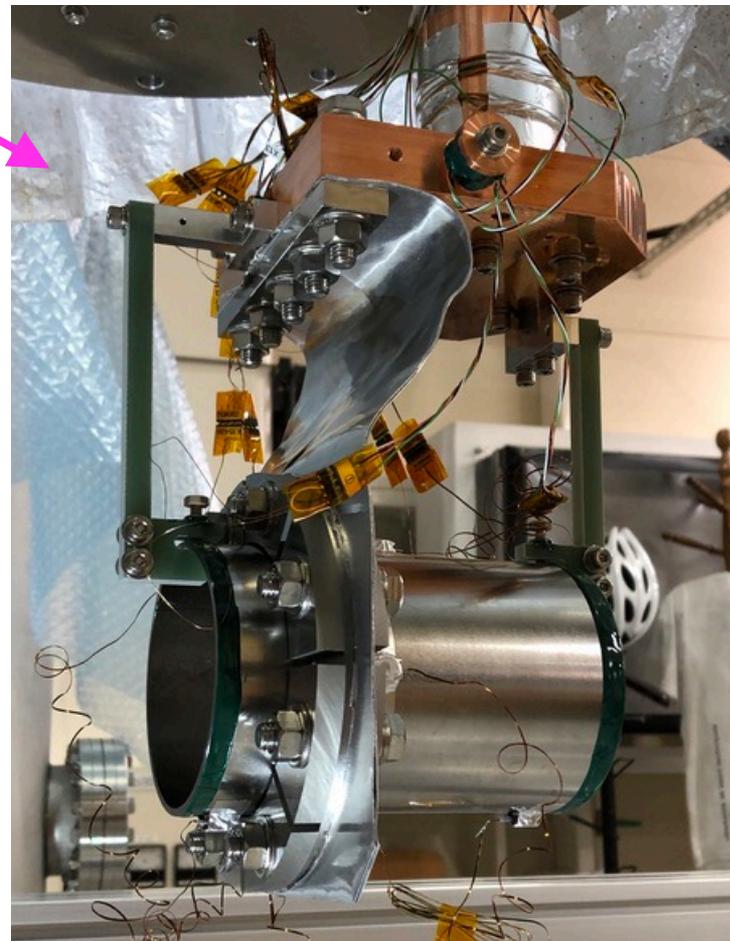
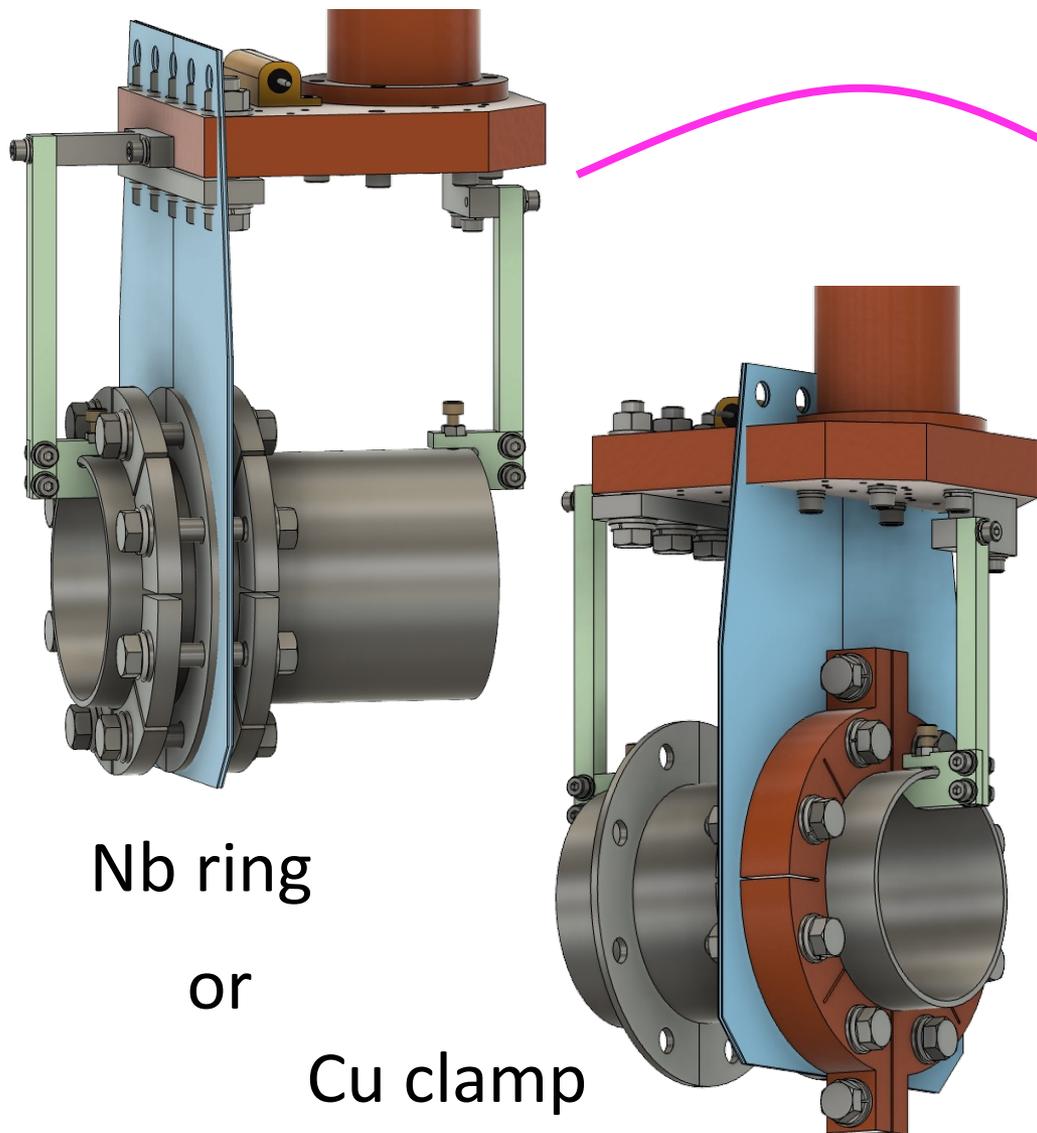
Cu clamp

Heating & Extraction

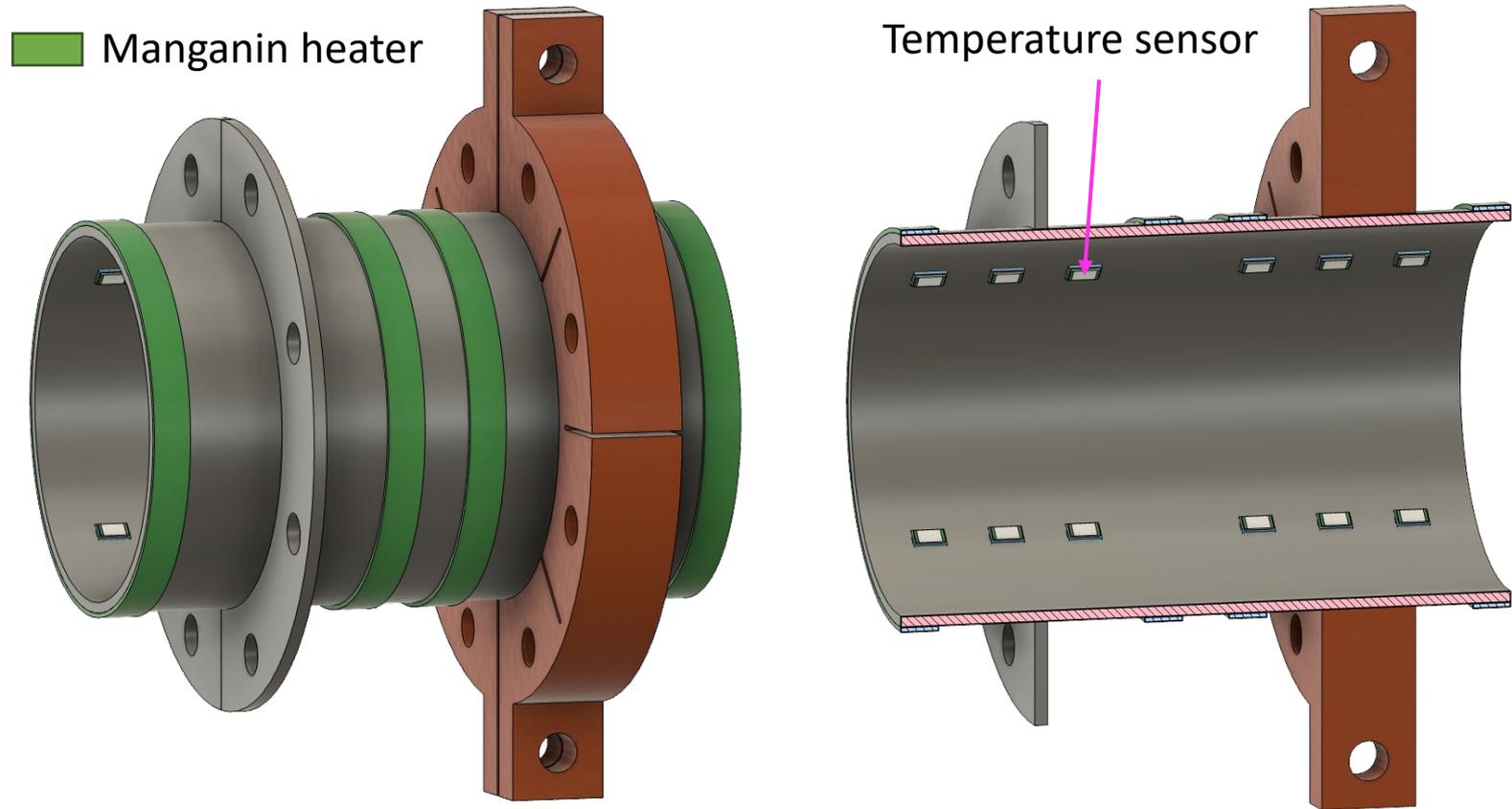
TESLA: Magnetic field color mapping



Small-scale Nb cylinder test in KEK

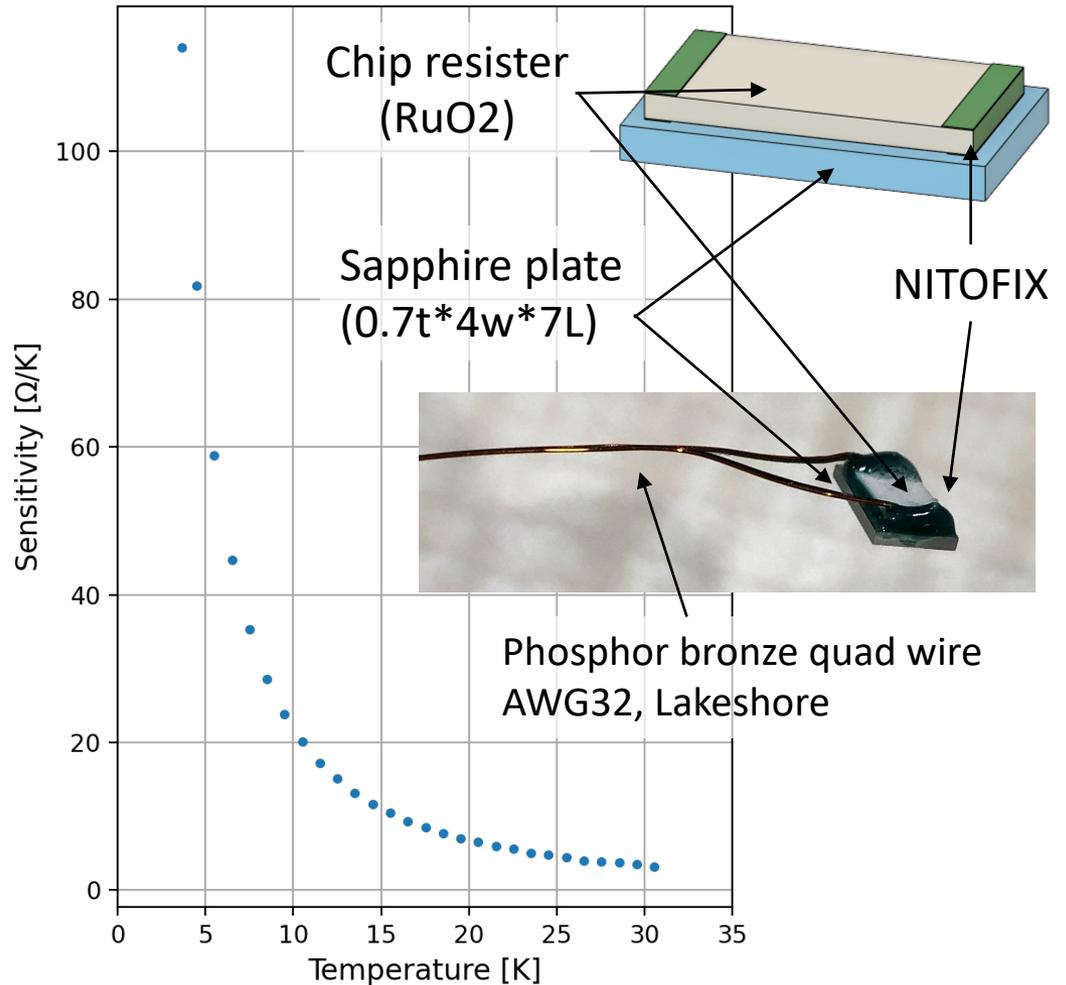
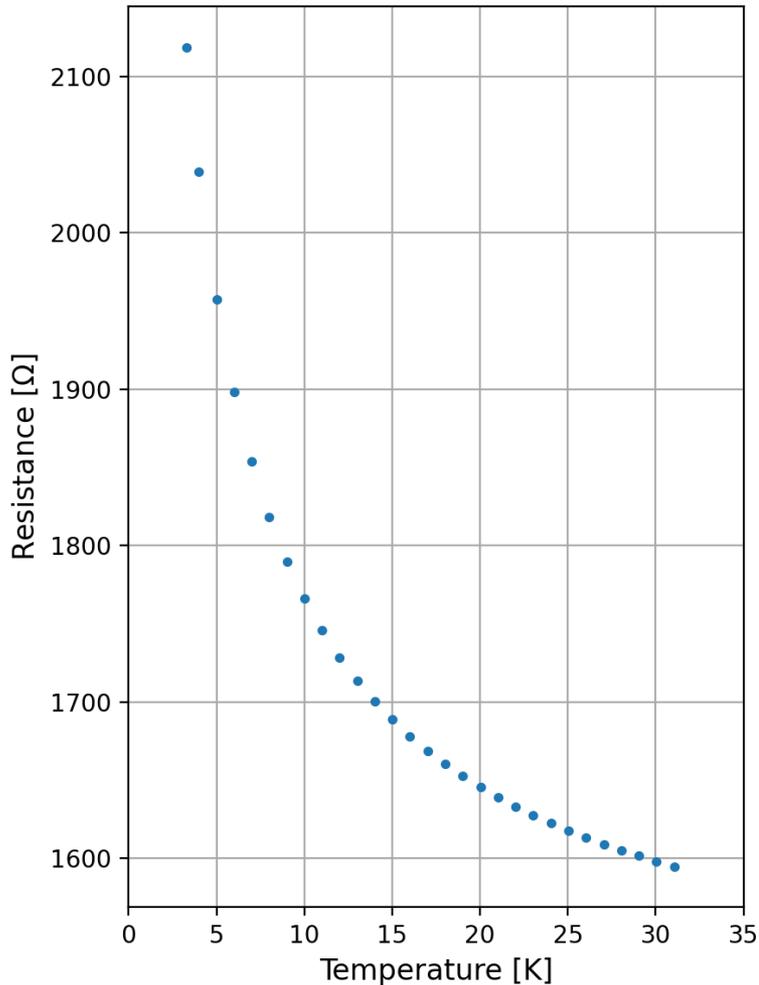


Temp distribution measurement



Each thermal contact is in between two heaters. Temperature distribution will be measured and compared when the same heater power is applied. Temperature sensors are installed inside the cylinder.

Cheap & small thermometer



Summary

- KEK has started conduction cooling study for the SRF cavity.
- We are now comparing the effectiveness of cooling scheme: Nb ring or Cu clamp.
- Developed cheap thermometers will give us detailed temp mapping and the way to go.
- Vertical test of Nb₃Sn cavity will be performed with GM/JT conduction cooling in half year (hopefully).